Biochemical and anatomical changes and yield reduction in rice (Oryza sativa L.) under varied salinity regimes

ABSTRACT

Five Malaysian rice (Oryza sativa L.) varieties, MR33, MR52, MR211, MR219, and MR232, were tested in pot culture under different salinity regimes for biochemical response, physiological activity, and grain yield. Three different levels of salt stresses, namely, 4, 8, and 12 dS m−1, were used in a randomized complete block design with four replications under glass house conditions. The results revealed that the chlorophyll content, proline, sugar content, soluble protein, free amino acid, and yield per plant of all the genotypes were influenced by different salinity levels. The chlorophyll content was observed to decrease with salinity level but the proline increased with salinity levels in all varieties. Reducing sugar and total sugar increased up to 8 dS m−1 and decreased up to 12 dS m−1. Nonreducing sugar decreased with increasing the salinity levels in all varieties. Soluble protein and free amino acid also decreased with increasing salinity levels. Cortical cells of MR211 and MR232 did not show cell collapse up to 8 dS m−1 salinity levels compared to susceptible checks (IR20 and BRRI dhan29). Therefore, considering all parameters, MR211 and MR232 showed better salinity tolerance among the tested varieties. Both cluster and principal component analyses depict the similar results.

Keyword: Oryza sativa L.; Salinity levels; Biochemical; Anatomical; Yield performances